

**Notice of Allowability**

Application No.

09/667,362

Applicant(s)

GRIMBERGEN ET AL.

Examiner

Jeffrie R. Lund

Art Unit

1763

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 4/13/04.
2. ☒ The allowed claim(s) is/are 1-10,12,13,15,18,20,22,23,30-34,36 and 51-63.
3. ☒ The drawings filed on 05 January 2002 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All   b) ☐ Some\*   c) ☐ None   of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date 9/21/00
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

Jeffrie R. Lund  
Primary Examiner  
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**EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ashok K. Janah on June 1, 2004.

The claims have been amended as follows:

1. (Currently amended) A substrate processing apparatus comprising:  
a process chamber comprising a substrate support, gas inlet, gas energizer, gas exhaust, and a wall having a radiation permeable wall portion, the radiation permeable wall portion comprising a plurality of ~~recesses~~ holes that extend through a portion or the entire thickness of the radiation permeable wall portion, the holes being sized to reduce limit the deposition of process residues therein; and  
a process monitoring system to monitor radiation passing through at least one of the ~~recesses~~ holes in the radiation permeable wall portion.
2. (Currently amended) An apparatus according to claim 1 wherein the process monitoring system is capable of monitoring a process that may be conducted in the process chamber to process a substrate, by monitoring radiation that is reflected from the substrate and that is passed through at least one of the ~~recesses~~ holes in the radiation permeable wall portion.
3. (Currently amended) An apparatus according to claim 1 wherein the ~~recesses~~ holes originate at an internal surface of the radiation permeable wall portion.

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4. (Currently amended) An apparatus according to claim 3 wherein the recesses holes terminate in the radiation permeable wall portion.

5. (Currently amended) An apparatus according to claim 1 wherein the recesses holes comprise an aspect ratio of at least about 0.25:1.

6. (Currently amended) An apparatus according to claim 5 wherein the recesses holes comprise an aspect ratio of at least about 3:1.

7. (Currently amended) An apparatus according to claim 5 wherein the recesses holes comprise an aspect ratio of less than about 12:1.

8. (Currently amended) An apparatus according to claim 1 wherein the recesses holes comprise an opening size of from about 0.1 to about 50 mm.

9. (Currently amended) An apparatus according to claim 1 wherein the recesses holes comprise a depth of from about 0.5 to about 500 mm.

10. (Currently amended) An apparatus according to claim 1 wherein the recesses holes comprise a diameter of less than about 10 times a thickness of a plasma sheath that may be formed in the chamber.

11. (Canceled)

12. (Previously presented) An apparatus according to claim 1 wherein the radiation permeable wall portion comprises one or more of  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{AlN}$ ,  $\text{BN}$ ,  $\text{Si}$ ,  $\text{SiC}$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$  and mixtures and compounds thereof.

13. (Previously presented) An apparatus according to claim 12 wherein the radiation permeable wall portion comprises quartz.

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14. (Canceled)

15. (Previously presented) An apparatus according to claim 1 wherein the wall further comprises a masking portion.

16. (Canceled)

17. (Canceled)

18. (Currently amended) A substrate processing apparatus comprising:  
a chamber having a support, gas inlet, gas energizer, and exhaust,  
and a ceiling having an integral radiation permeable wall portion, the radiation permeable wall portion having a recess hole that extends through a portion or the entire thickness of the radiation permeable wall portion, the hole being sized to reduce limit the deposition of process residues therein; and

a process monitoring system to monitor radiation passing through the recess hole in the radiation permeable wall portion,

whereby a substrate held on the support may be processed by process gas introduced by the gas inlet, energized by the gas energizer, and exhausted by the exhaust.

19. (Canceled)

20. (Currently amended) An apparatus according to claim 18 wherein the recess hole controls an access of energized gas species to the radiation permeable wall portion.

21. (Canceled)

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22. (Currently amended) An apparatus according to claim 18 wherein the ~~recesses comprise~~ hole comprises an aspect ratio of at least about 0.25:1.

23. (Currently amended) An apparatus according to claim 18 wherein the process monitoring system is capable of monitoring radiation that is reflected from the substrate and that is passed through the recess hole in the radiation permeable wall portion.

24. (Canceled)

25. (Canceled)

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Canceled)

30. (Currently amended) A substrate processing apparatus comprising:  
a process chamber comprising  
    a substrate support,  
    a gas inlet,  
    a gas energizer,  
    a gas exhaust, and  
    a wall comprising a radiation permeable wall portion, the radiation permeable wall portion having a plurality of recesses holes originating at an internal surface of the radiation permeable wall portion, the recesses holes having an aspect ratio sized to reduce limit the deposition of process residues therein; and

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a process monitoring system to monitor radiation passing through at least one of the recesses holes in the radiation permeable wall portion.

31. (Currently amended) An apparatus according to claim 30 wherein the process monitoring system is capable of monitoring a process that may be conducted in the chamber to process a substrate, by monitoring radiation that is reflected from the substrate and that is passed through at least one of the recesses holes in the radiation permeable wall portion.

32. (Currently amended) An apparatus according to claim 30 wherein the recesses holes comprise an aspect ratio of at least about 0.25:1.

33. (Currently amended) An apparatus according to claim 30 wherein the recesses holes comprise a passageway inclined at an angle of less than about 90 degrees.

34. (Previously presented) An apparatus according to claim 30 wherein the radiation permeable wall portion comprises one or more of  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{AlN}$ ,  $\text{BN}$ ,  $\text{Si}$ ,  $\text{SiC}$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$  and mixtures and compounds thereof.

35. (Canceled)

36. (Currently amended) An apparatus according to claim 30 wherein the recesses holes are arranged to pass therethrough radiation originating from the plasma or radiation reflected from different portions of the substrate.

37. (Canceled)

38. (Canceled)

39. (Canceled)

40. (Canceled)

41. (Canceled)

42. (Canceled)

43. (Canceled)

44. (Canceled)

45. (Canceled)

46. (Canceled)

47. (Canceled)

48. (Canceled)

49. (Canceled)

50 (Canceled)

51. (Currently amended) A substrate processing apparatus comprising:  
a process chamber comprising a substrate support, a gas inlet, a  
gas energizer, a gas exhaust, and a sidewall about the support, the sidewall having an  
integral radiation permeable wall portion, the radiation permeable wall portion  
comprising at least one recess hole that extends through a portion or the entire

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thickness of the radiation permeable wall portion, the hole being sized to reduce limit  
the deposition of process residues therein; and

a process monitoring system to monitor radiation passing through  
the at least one recess hole in the radiation permeable wall portion.

52. (Currently amended) An apparatus according to claim 51 further comprising a second recess hole in the sidewall.

53. (Currently amended) An apparatus according to claim 51 wherein the recess hole is inclined relative to the sidewall.

54. (Currently amended) An apparatus according to claim 53 wherein the recess hole is inclined from about 50 degrees to about 60 degrees relative to the sidewall.

55. (Currently amended) An apparatus according to claim 51 wherein the process monitoring system is capable of monitoring a process that may be conducted in the process chamber to process a substrate, by monitoring radiation that is reflected from the substrate and that is passed through the at least one recess hole in the radiation permeable wall portion.

56. (Currently amended) An apparatus according to claim 51 wherein the recess hole originates at an internal surface of the radiation permeable wall portion.

57. (Currently amended) An apparatus according to claim 56 wherein the recess hole terminates in the radiation permeable wall portion of the sidewall.

58. (Currently amended) An apparatus according to claim 51 wherein the recess hole comprises an aspect ratio of at least about 0.25:1.



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59. (Currently amended) An apparatus according to claim 51 wherein the recess hole comprises an opening size of from about 0.1 to about 50 mm.

60. (Currently amended) An apparatus according to claim 51 wherein the recess hole comprises a depth of from about 0.5 to about 500 mm.

61. (Currently amended) An apparatus according to claim 51 wherein the radiation permeable wall portion comprises a plurality of recesses holes.

62. (Currently amended) An apparatus according to claim 51 wherein the sidewall comprises a plurality of ~~recesses~~ holes on opposing sides of the support.

63. (Previously presented) An apparatus according to claim 51 wherein the sidewall further comprises a masking portion.

64. (Canceled)

65. (Canceled)

66. (Canceled)

67. (Canceled)

68. (Canceled)

69. (Canceled)

2. The following is an examiner's statement of reasons for allowance: the apparatus as claimed in claims 1, 18, 30, and 51, specifically, the wall comprising a radiation permeable wall portion, the radiation permeable wall portion having a hole or plurality of

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holes originating at an internal surface of the radiation permeable wall portion, the hole(s) sized to limit the deposition of process residues therein was not found in or suggested by the art.

The nearest art is Howard, US Patent 6,400,458. Howard teaches a processing chamber having a roughened upper wall and a process monitoring system. Howard, however, does not teach how the wall is roughened or if a pattern is formed. It is possible that there are at least partial holes formed in the roughened surface, but this is not by any means certain. Han et al, US Patent 6,623,595, Hofmann et al, US Patent 6,132,566, and Wollam, US Patent 4,037,945, for example, teach using grooves to roughen the surface. Therefore, a roughened surface does not inherently have holes.

Furthermore, even if there are holes in a roughened surface, the holes of the present invention are sized to limit the deposition of process residues therein. The roughened surface of the prior art and any holes that may exist are not sized to limit the deposition of process residues therein. The two means of manufacturing a roughened surface with holes are bead blasting or etching the surface to produce holes. These holes are of random location and random size and are designed to increase the surface area of the wall. The purpose for doing so is to reduce the thickness of deposited material by increasing the area over which it is deposited thus extending the time between cleanings, and slows the production of flakes or particles of deposited residues. Thus the purpose of roughening the surface is not to limit the deposition of material but to spread the coating out to better hold the deposited material and prevent it from flaking. Moreover, if the holes were sized to limit deposition of process residues

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therein, the purpose of roughening the surface would be destroyed because instead of increasing the available surface area upon which the process residues could deposit, the available surface area would be decreased, thus increasing the thickness of the deposited residues, the amount of cleaning needed, and the number of particles generated. Therefore, no teaching was found to size the holes to limit the deposition of process residues therein.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

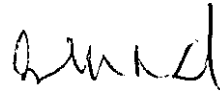
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).



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6/1/04